

# Introduction to Confined Space Safety



**OR-OSHA 215**  
0501



Trainer Name

Position

Company

Phone

Email

(Revise as needed)



# Objectives

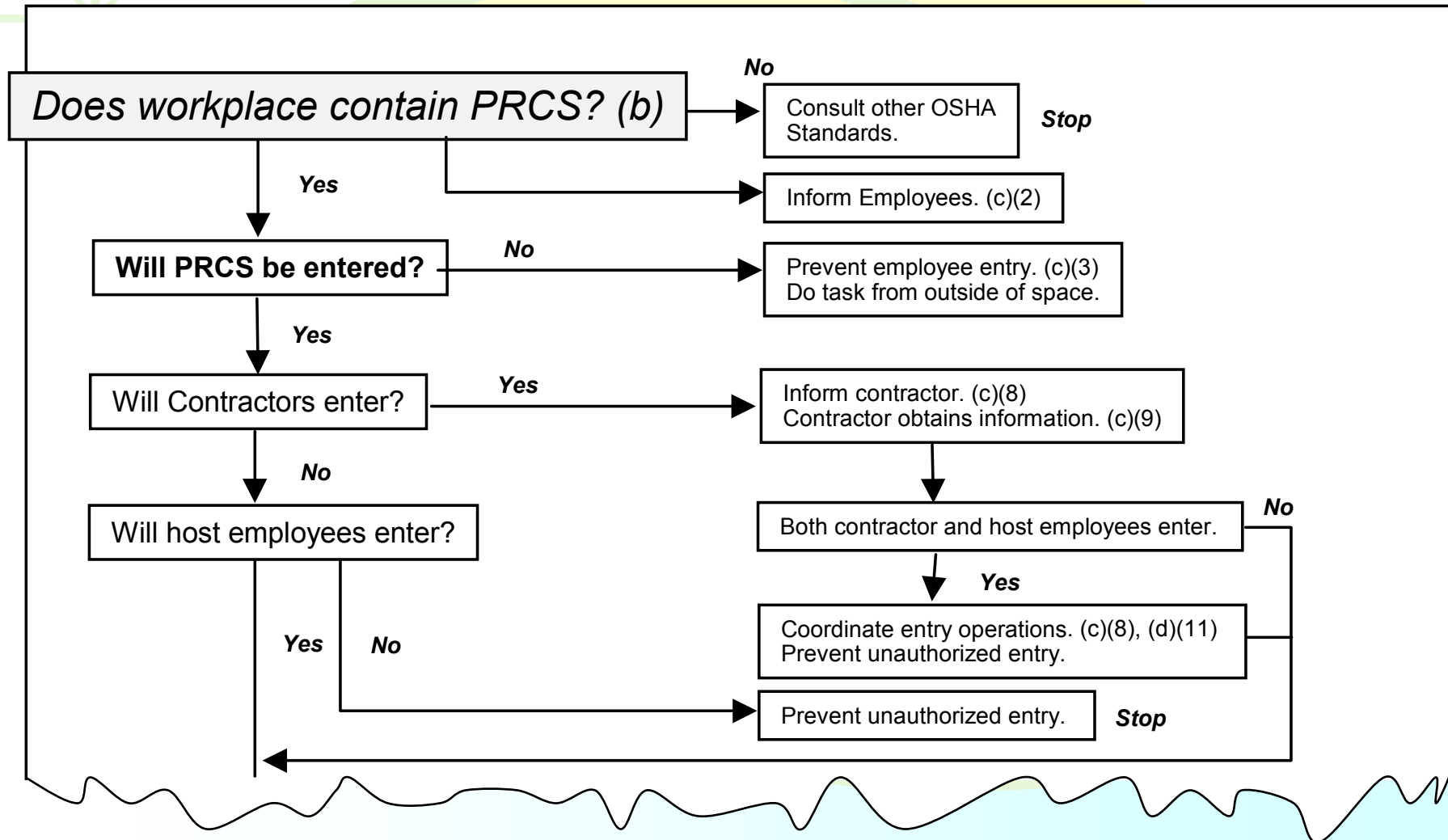
**This class provides the following information:**

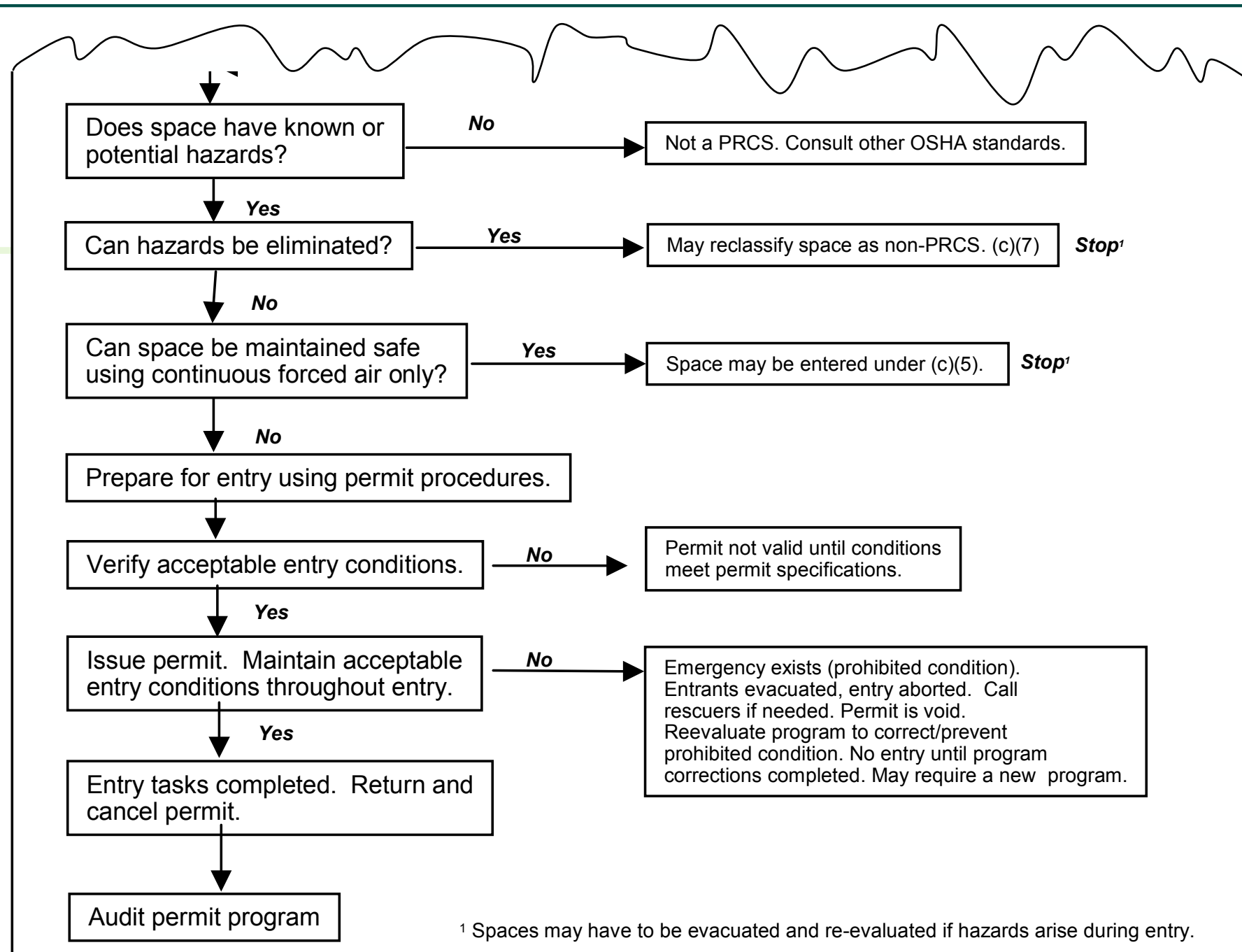
- 1. Criteria for confined spaces and permit-required confined spaces.**
- 2. Hazards which may exist in permit-required confined spaces.**
- 3. Steps in developing a permit-required confined space program.**
- 4. Training requirements.**

# ***Why a Permit-Required Confined Space Program?***



# A quick reference to the Permit-Required Confined Space Standard





¹ Spaces may have to be evacuated and re-evaluated if hazards arise during entry.

# Evaluate Your Workplace

*1. Does the workplace contain a confined space?*

**Yes! if the space is...**

1. Large enough for whole body to enter and work, and
2. Limited access or egress, and
3. Not designed for continuous occupancy

What is meant by *limited or restricted entry and exit*?

What is meant by *not designed for continuous occupancy*?





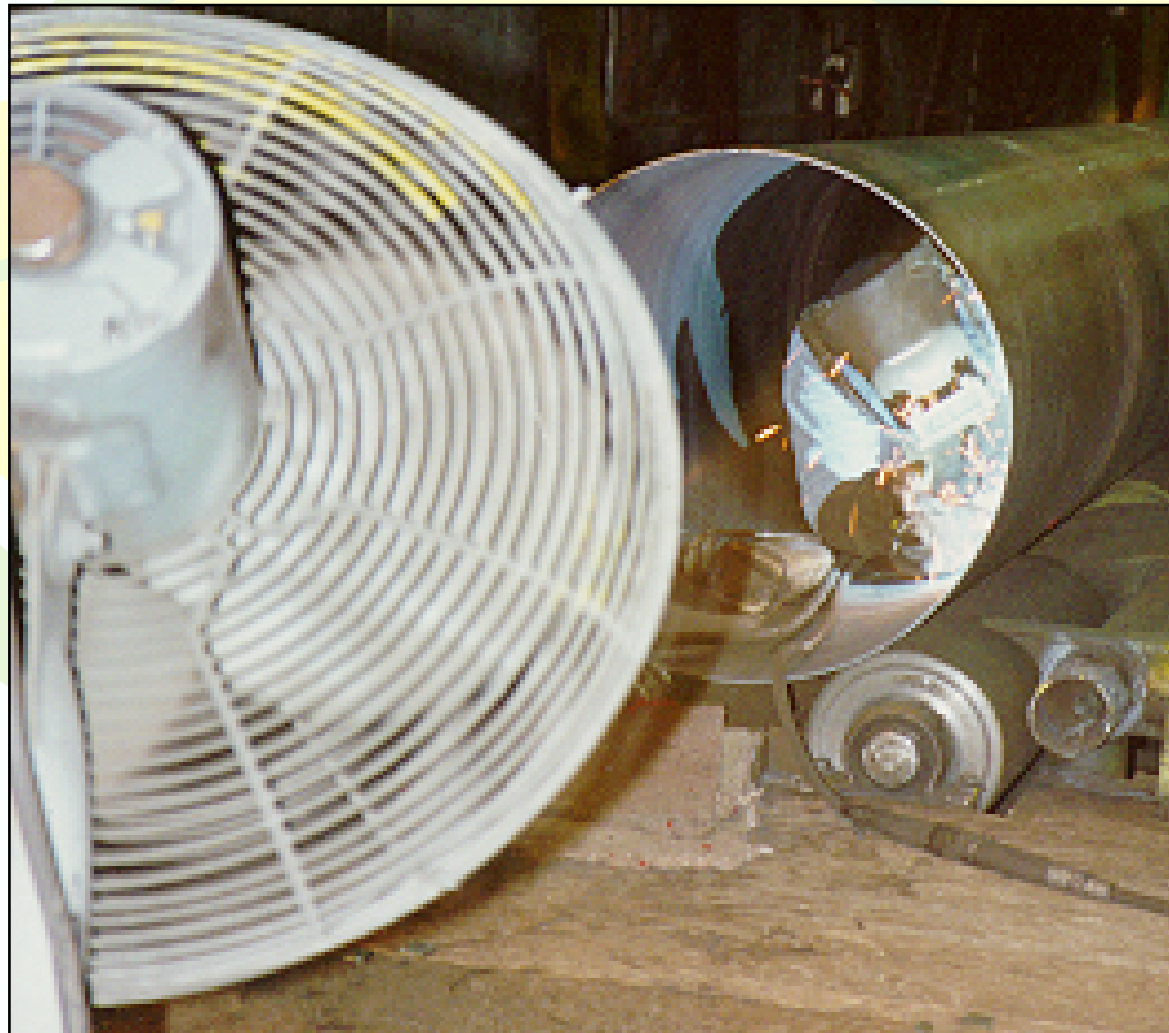
## ***2. Does the workplace contain permit-required confined spaces (PRCS)?***

***Yes, if it's a confined space and it...***

- 1. Contains hazardous atmosphere, or***
- 2. Has potential for engulfment, or***
- 3. Has dangerous configuration, or***
- 4. Contains other serious safety or health hazards.***

# Evaluating Confined Spaces for Hazards

## Hazardous Atmospheres



## 1. Oxygen Level {too high or too low?}

**23.5% and above** = *High*

**20.8 - 21%** = *Normal*

**19.5% and below** = *Deficient*

**Atmospheric conditions in a confined space can change greatly within a few minutes.**

***Why would too much oxygen be hazardous?***

***How could you have too much oxygen?***

***What are some causes or indications of possibly having a deficient oxygen atmosphere inside a space?***

## **Suspect O<sub>2</sub> Deficient When:**

- **Space has been closed up, sealed or ventilated before entry.**
- **Has contained inerted atmosphere or has been purged.**
- **Contains any amount of water or organic material.**
- **Metal Oxidation - rusting.**
- **Combustion processes.**
- **Displacement by other gases.**
- **Coatings, sludges, materials with cure and/or absorb oxygen - activated charcoal.**

## ***Dangers of Low Oxygen Levels***

**16 - 12% O<sub>2</sub> in Air**

Deep breathing, fast heartbeat, poor attention, poor thinking, poor coordination

**14 - 10% O<sub>2</sub> in Air**

Faulty judgment, intermittent breathing, rapid fatigue (possibly causing heart damage), very poor coordination, lips turning blue

**10% or less O<sub>2</sub> in Air**

Nausea (vomiting), loss of movement, loss of consciousness followed by death

**Less than 6% O<sub>2</sub> in Air**

Spasmodic breathing, convulsive movement, death in approx. eight minutes

***4% - 6% O<sub>2</sub> in Air***

*Coma in 40 seconds*

## **29 CFR 1926 Subpart P**

**Air quality tests taken before entry.**

**Excavations more than 4 ft. deep when hazardous atmosphere exists or could exist.**



**Tests conducted as necessary, including checks for flammable gases and oxygen deficiency.**

**Where hazardous atmospheres exist or could be expected to exist, emergency rescue equipment must be on worksite and readily accessible.**

## 2. Flammable/Explosive Gas, Vapor, Mist

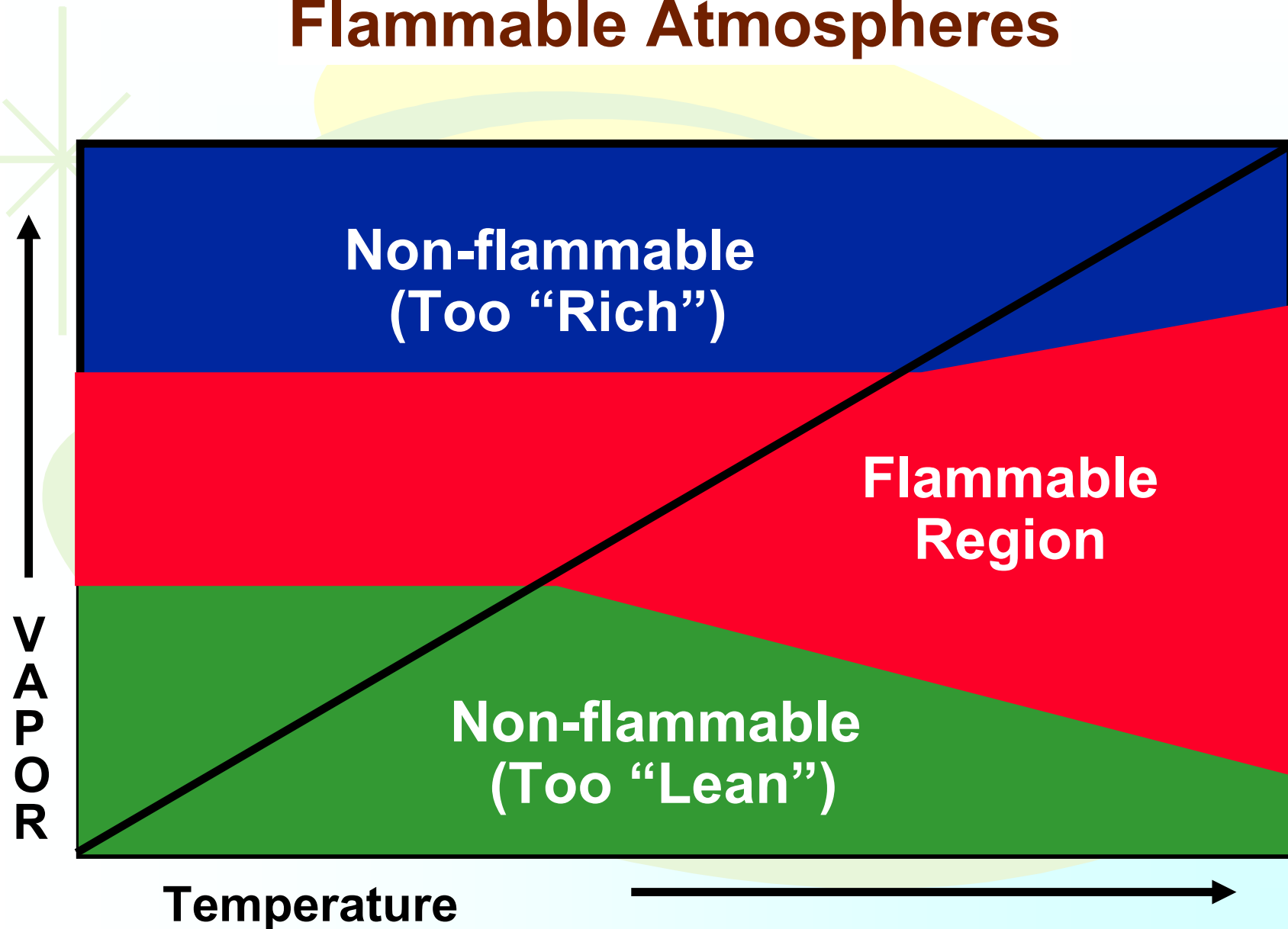
Hazardous if it exceeds 10% of its *lower flammable limit* (LFL)

Lower Flammable Limit (LFL), or lower explosive limit (LEL), is the lowest concentration of air-fuel mixture at which a gas or vapor can ignite.

Upper Flammable Limit (UFL), or upper explosive limit (UEL), is the highest concentration of air-fuel mixture that can be ignited.

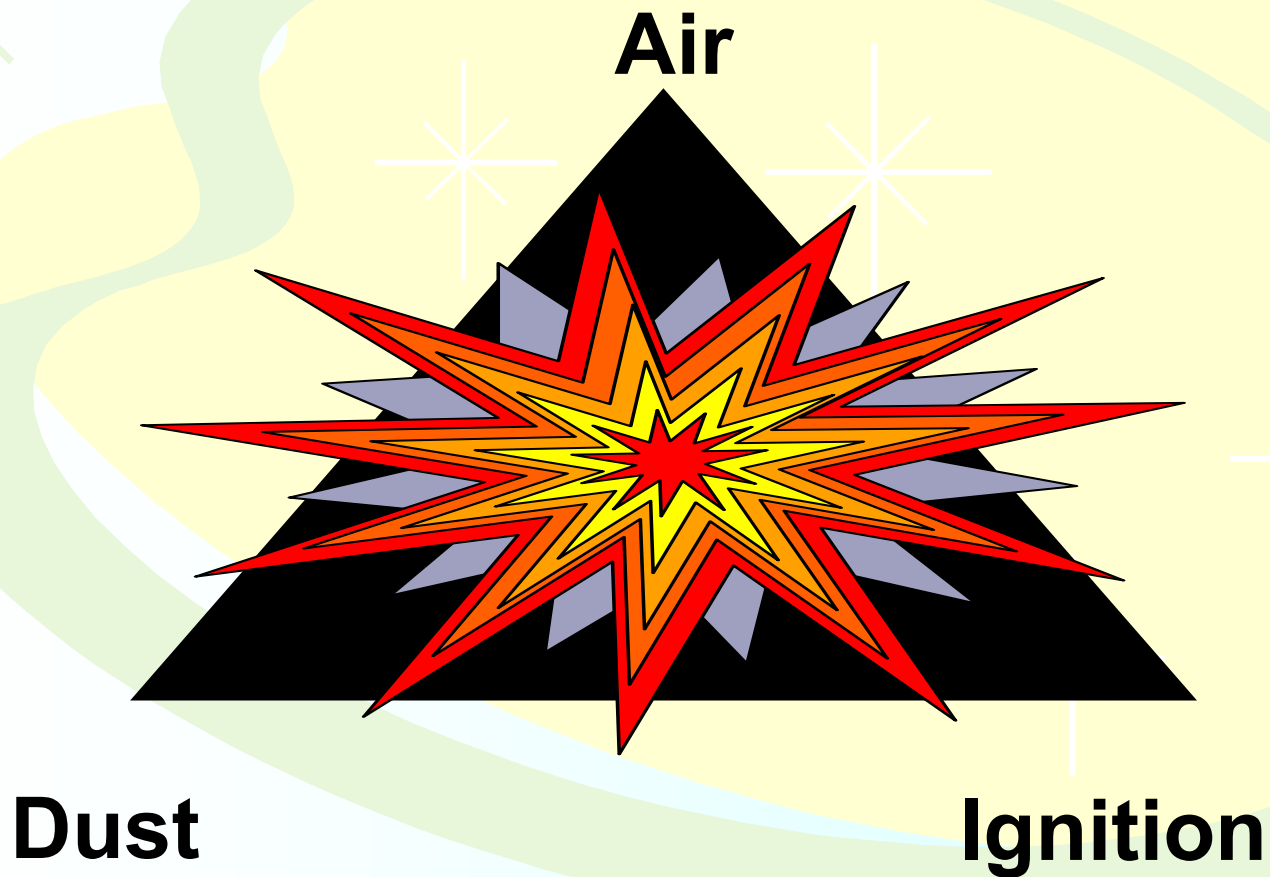


# Flammable Atmospheres



# Airborne Combustible Dust

Explosive when concentration is between the LEL & UEL!

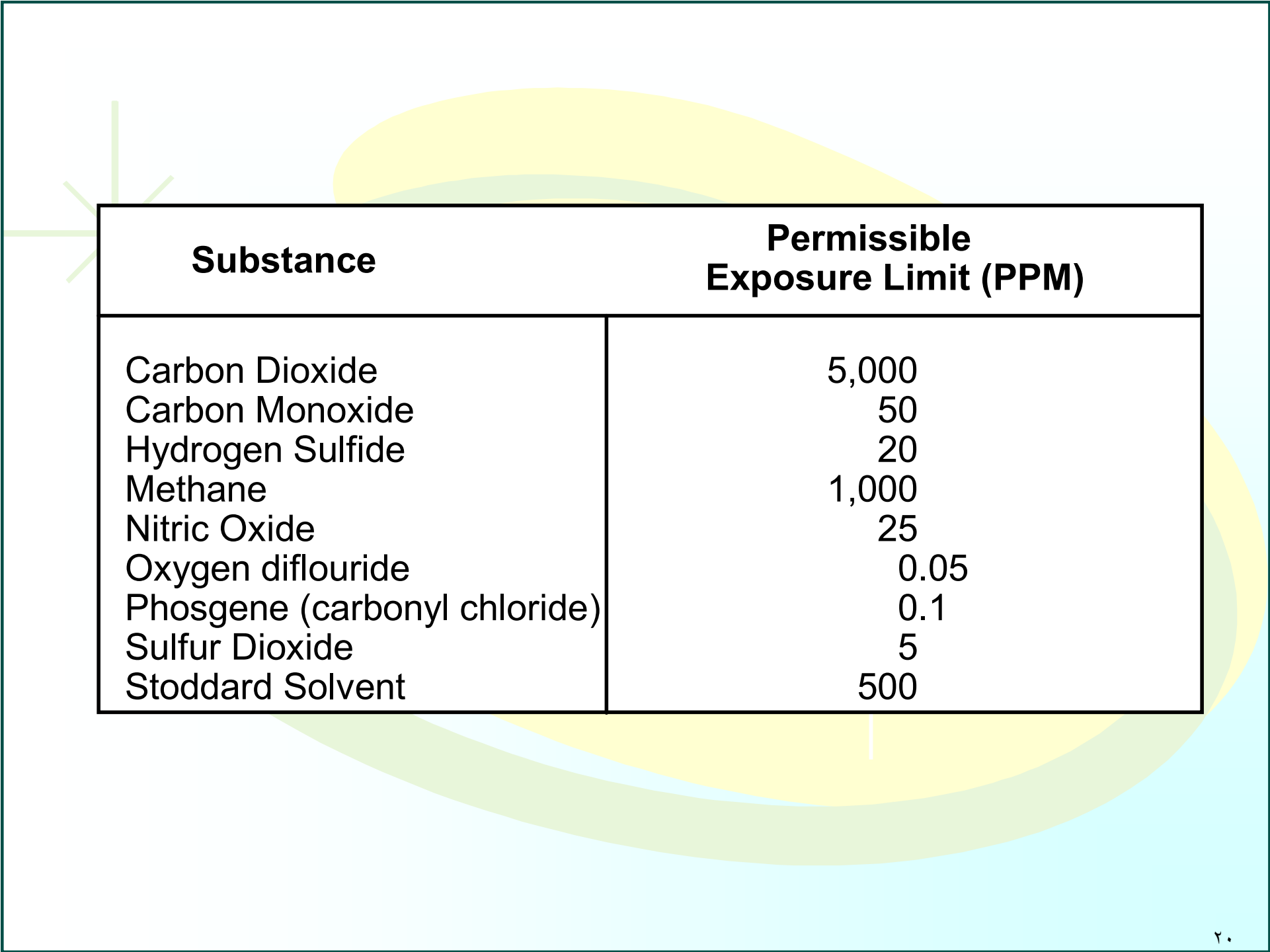


### **3. Toxic Substances**

**Hazardous if they exceed doses or *permissible exposure limits* (PEL) published in:**

**OR-OSHA Division 2 Subdivisions G & Z**

**Refer to your material safety data sheets for chemical-specific toxicity characteristics, health hazards, reactivity hazards, etc.**



Substance	Permissible Exposure Limit (PPM)
Carbon Dioxide	5,000
Carbon Monoxide	50
Hydrogen Sulfide	20
Methane	1,000
Nitric Oxide	25
Oxygen difluoride	0.05
Phosgene (carbonyl chloride)	0.1
Sulfur Dioxide	5
Stoddard Solvent	500

# Engulfment

- Liquid or flowable solids
- Can be aspirated
- Can cause death by:

Plugging respiratory system,  
Strangulation,  
Constriction, or  
Crushing

# Hazardous Configuration

**Can trap or asphyxiate**

**Inwardly converging walls, or**

**Floor slopes downward, or**

**Floor tapers to smaller cross-section**

## Any Other Recognized Serious Safety or Health Hazard



Electrical equipment

Mechanical equipment

Visibility - lighting

Biohazards

Claustrophobia

Noise

Radiation

Temperature

Once you have evaluated and identified the permit-required confined spaces at your workplace, inform employees through signs and/or other equally effective means.





# Permit-Required Confined Space Entry





## How is PRCS “entry” defined?

When any part of the body breaks the plane of the opening in a permit required confined space.

***If permit-required confined spaces will not be entered, you must still take all measures to prevent entry!***

***How?***

# When contractors enter your permit spaces:

## **Employer**

- ⌞ Ensure compliance with permit space program
- ⌞ Hazards of the permit space
- ⌞ Precautions and procedures
- ⌞ Coordinate entry operations (if conducted)
- ⌞ Debrief when completed (hazards found or created)

# When contractors enter your permit spaces:

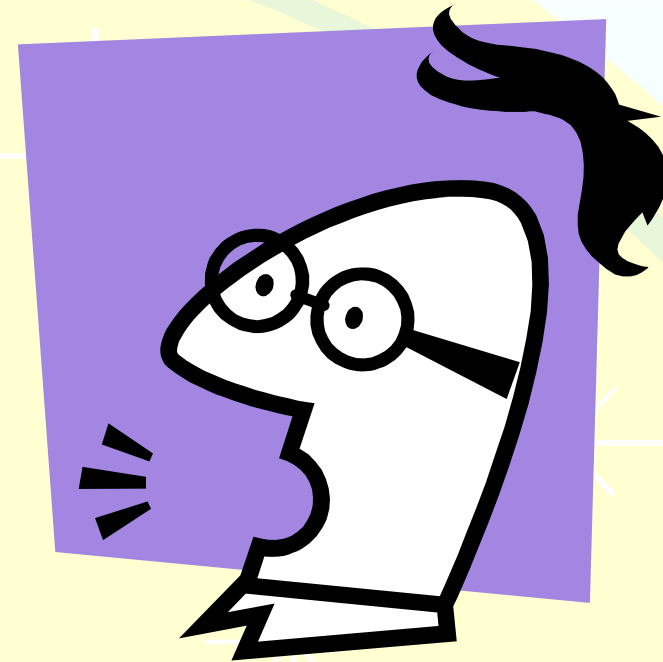
## Contractor

- ↖ Obtain information about permit space hazards & entry operations
- ↖ Coordinate entry operations (if conducted)
- ↖ Brief employer on permit space program being used
- ↖ Debrief employer on hazards confronted or created

*What does this basically involve?*

**Quick Quiz**

**(actually a recap)!**

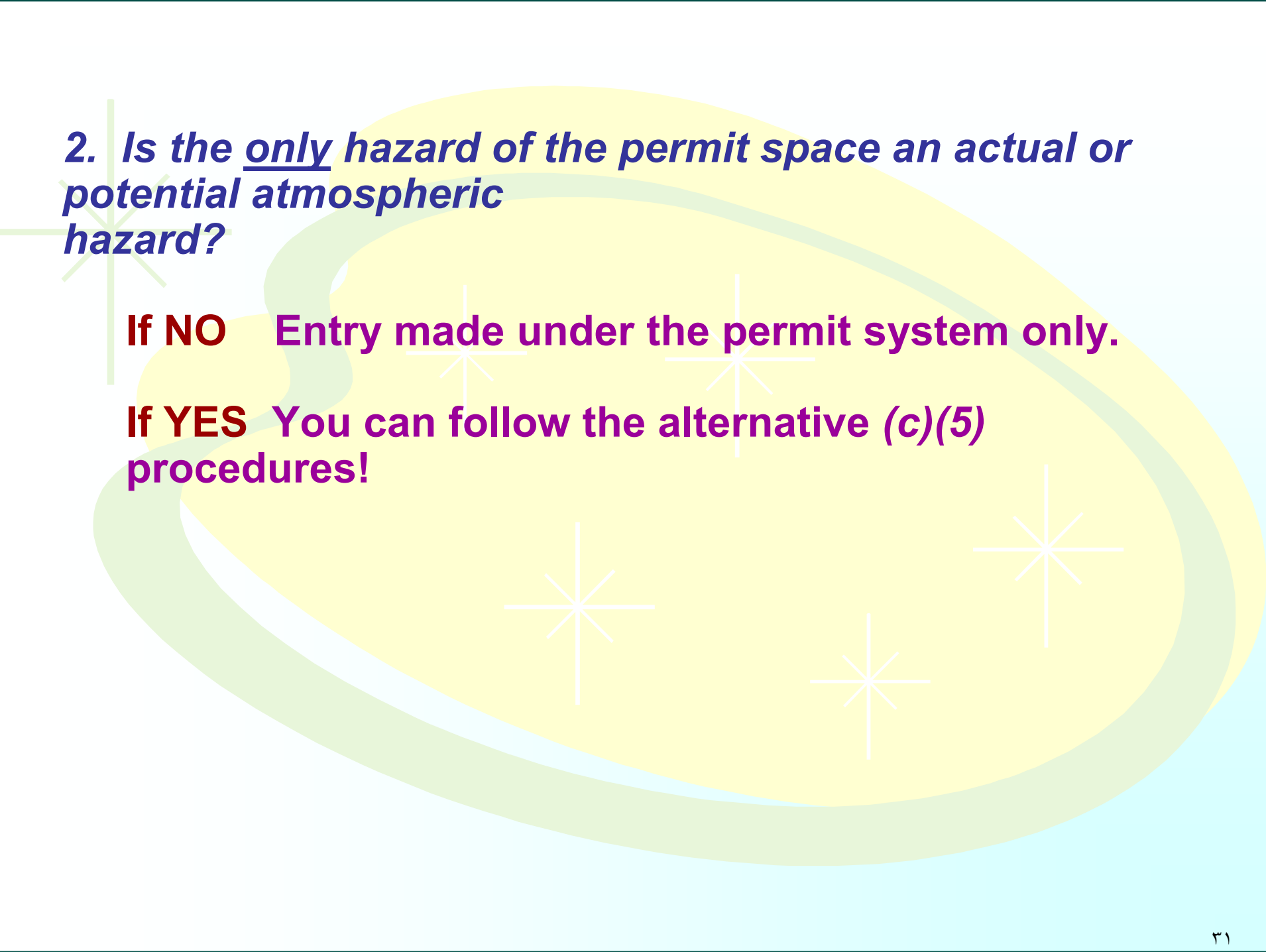


# When your Employees enter Permit-Required Confined Spaces

1. *Can the hazard(s) which made the space a permit space be eliminated?*

**If YES** The space can be reclassified as a nonpermit-required space.

**If NO** Prepare for permit entry or consider another question.....



2. Is the only hazard of the permit space an actual or potential atmospheric hazard?

**If NO** Entry made under the permit system only.

**If YES** You can follow the alternative (c)(5) procedures!

## Before we discuss (c)(5) procedures:



**Control of the atmospheric hazard through forced air ventilation does not constitute *elimination* of the hazard.**



**When following these (c)(5) procedures exclusively, the employer is not required to develop a permit entry system, establish an entry team, or provide a rescue system.**

**Of course, these elements are required when entering permit spaces through the permit system.**





## **The alternative (c)(5) procedures are allowed when...**

- ↖ **Verification is made that using continuous forced air ventilation is safe;**
- ↖ **Monitoring and inspection data supports the atmospheric hazard is the only hazard and the forced air ventilation is effective;**
- ↖ **Data is documented and made available to entrants.**

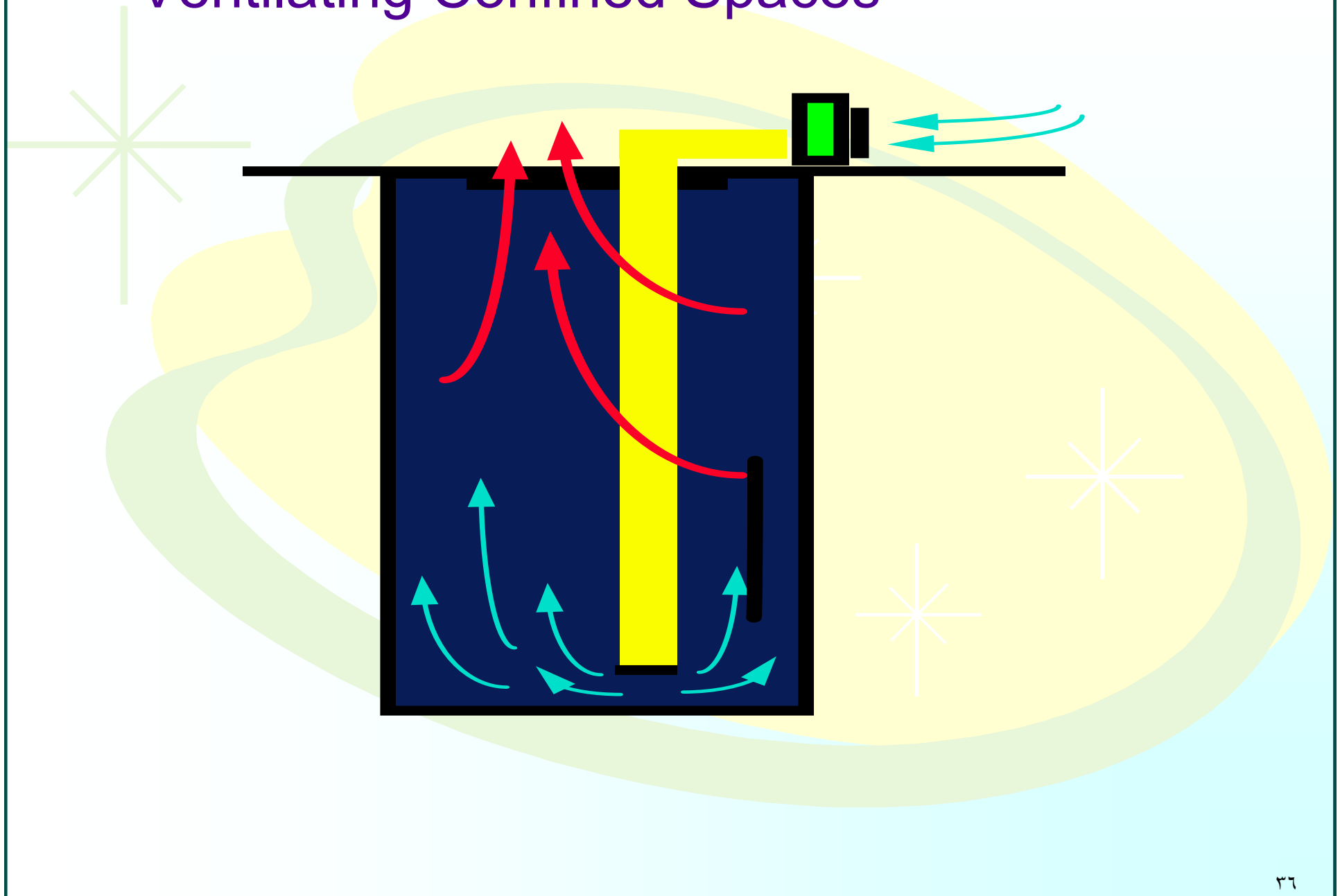
## **And once the above are met.....**

- ↖ **Ensure safety before removing a cover and guard opening immediately;**
- ↖ **Test internal atmosphere (O,F,T) - observation available to entrant;**
- ↖ **Continuous forced air ventilation;**
- ↖ **Atmosphere periodically tested - observation available to entrant;**
- ↖ **Evacuate immediately if necessary and evaluate what went wrong;**
- ↖ **Verify these procedures were conducted through a written certification.**

## More on the Alternative (c)(5) Procedures!

- ⌞ **No entry until FAV has eliminated any hazardous atmosphere;**
- ⌞ **Direct FAV to ventilate immediate work area and areas where the entrant will likely be (be aware of pockets within the space);**
- ⌞ **FAV must continue until all workers have left the space;**
- ⌞ **FAV must have clean source;**
- ⌞ **FAV must not increase the hazards in the space.**

# Ventilating Confined Spaces



# Ventilation Equipment

- **Natural** - rarely dependable

- **Mechanical** -

**preferred, positive hazard reduction**

**depends on configuration**

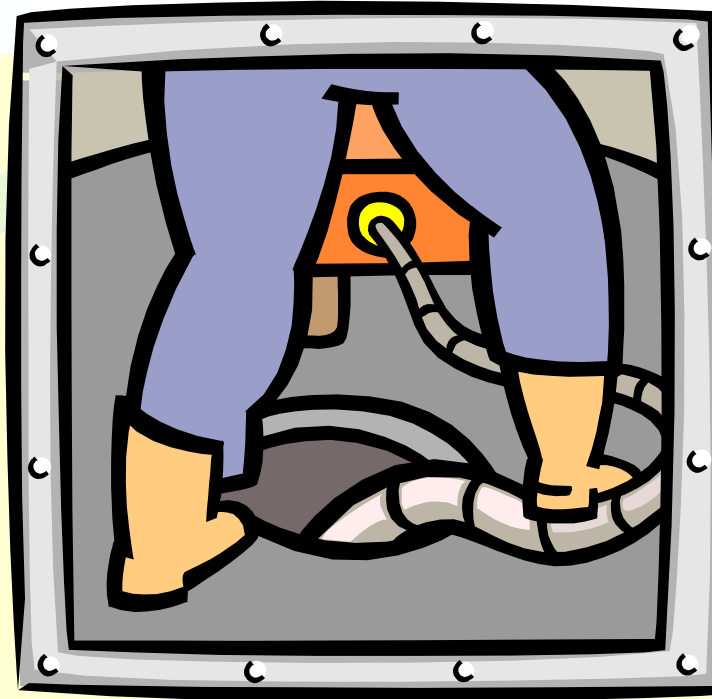
**consider nature of atmospheric hazard**



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**Remember, ventilation must  
be continuous during entry!**

# Air Monitoring Equipment

Used during initial investigation prior to, and during confined space entry.

## Tests for:

1. Oxygen content
2. Flammable gases and vapors
3. Toxic gases and vapors

(Note: You must test in this order)



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## **Detector Tubes**

**Sealed glass tubes**

**Crystals react with airborne chemicals**

**Reaction results in color change**

**Specific for the substance of concern**

**Can be inaccurate +/- 25%**

**False readings from other chemicals**

## **Gas Detection Instruments**

**Sensors measure concentrations**

**Results in a meter or digital reading; alarms**

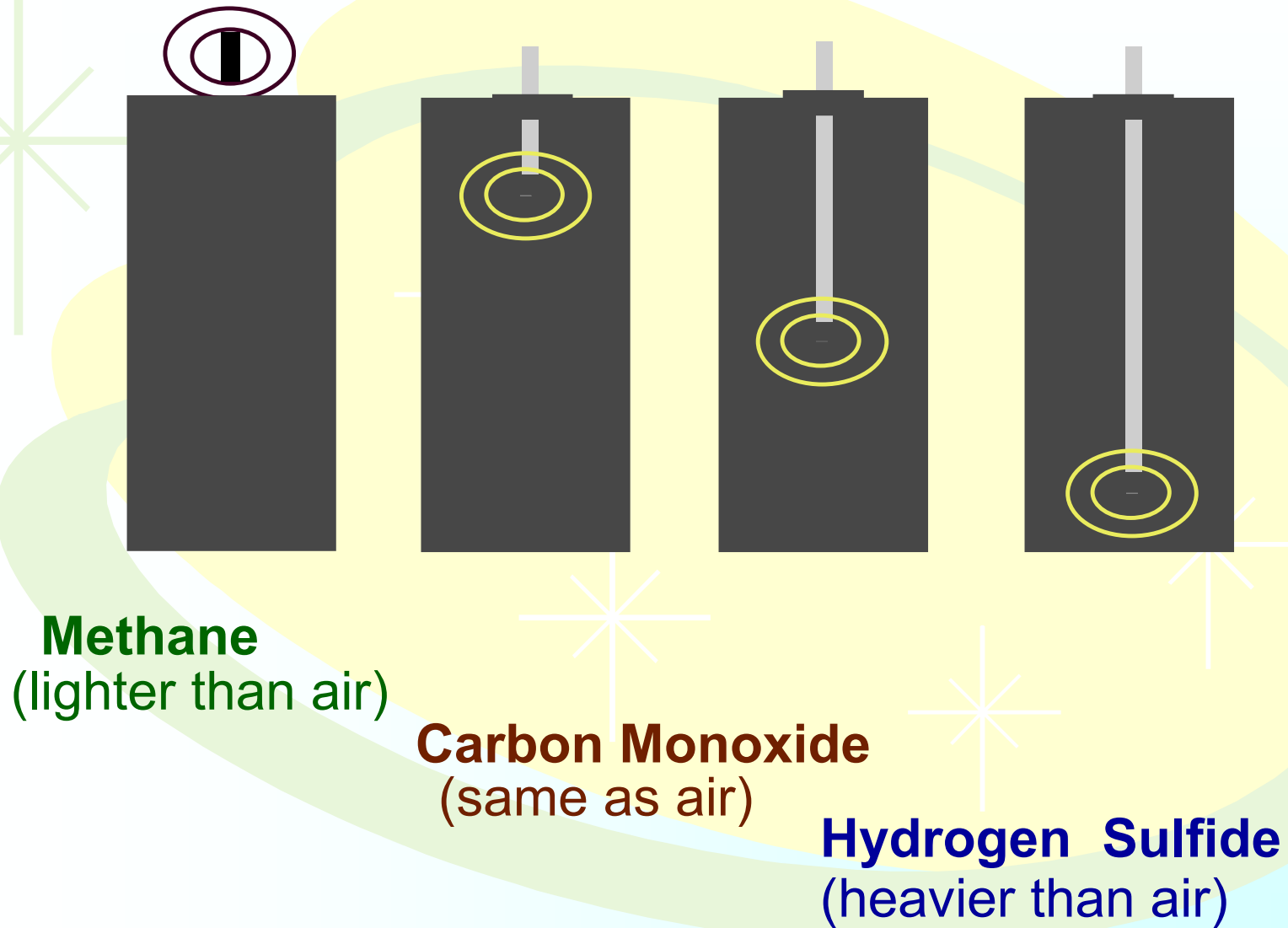
**Portable multi-gas instruments**

**Accurate**

**May react to interfering chemicals**



# Sampling



# The Entry Permit System



## ***What is the written plan?***

- The measures implement to prevent unauthorized entry
- The identification & evaluation of all permit space hazards prior to entry
- The development & implementation of safe entry operations
- Providing and maintaining all necessary equipment (PPE, monitors, etc.)
- Evaluating permit space conditions before & during entry operations
- Providing at least one attendant & developing procedures for multiple spaces
- Designating and training all persons who have active roles

## ***What is the written plan?***

- **Developing and implementing rescue & emergency procedures**
- **Developing and implementing the entry permit procedures (issue, use, cancel)**
- **Coordinating multi-employer entry procedures**
- **Developing procedures for concluding the entry (closing off the space)**
- **The review & evaluation of entry operations during the year (as needed)**
- **The annual permit space program review using the historic permits**

## **The entry permit must document:**

- 1. Permit space to be entered;**
- 2. Purpose of the entry;**
- 3. Date & duration of the entry permit;**
- 4. Authorized entrants;**
- 5. Attendants;**
- 6. Entry supervisor and place for signature;**
- 7. Hazards of the permit space;**
- 8. Isolation measures - hazard controls (purging, ventilating, etc.);**

## **The entry permit must document:**

- 9. The acceptable entry conditions;**
- 10. Test results (initial/periodic) with initials/name of tester & time;**
- 11. Rescue/emergency services available and means to summon;**
- 12. Communication procedures between entrant and attendant;**
- 13. All necessary equipment (PPE, Testing/Communication equipment, etc.);**
- 14. Other necessary information;**
- 15. Any additional permits (hot work, etc.).**

# Duties to the Entry Team



**The Entry Supervisor**

**The Attendant**

**The entrant**

# Identify Equipment For:



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**Testing and monitoring**

**Ventilating**

**Personal protection (PPE)**

**Communication**

**Lighting**

**Barriers and shields**

**Entry and exit**

**Rescue and emergency**



# Rescue and Emergency procedures



# Three options to permit-required confined space rescue



**1. Arrange for rescue service from an outside source.**

**2. Arrange for your own employees to provide rescue.**

**3. Provide for non-entry rescue.**

# Training



## Who?

## When?

- **Initially**
- **When change in assigned duties**
- **When change in permit space operations**
- **Inadequacies in the employee's performance**

**Training must establish worker proficiency and include new or revised procedures to ensure compliance with permit space standards.**

***Be sure to include demonstration!***



## **The content of the training must include:**

**Nature of hazards**

**Actions to take when exposed to hazards**

**Use of rescue and emergency equipment**

**Verify the appropriate training was completed through a written certification.**

**The certification must contain each employee's name, the signature(s) of the trainers, and the date(s) of the training.**

# *Appendices*



**Before you run, time to review!**

